

OSHA Stairway and Handrail Regulations

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OSHA Regulations**Stair Rails**

The following general requirements apply to all stair rails:

- _ Stairways with four or more risers or rising more than 30 inches (76 cm) in height— whichever is less—must be installed along each unprotected side or edge. When the top edge of a stair rail system also serves as a handrail, the height of the top edge must be no more than 37 inches (94 cm) nor less than 36 inches (91.5 cm) from the upper surface of the stair rail to the surface of the tread.
- _ Stair rails installed after March 15, 1991, must be not less than 36 inches (91.5 cm) in height.
- _ Top edges of stair rail systems used as handrails must not be more than 37 inches (94 cm) high nor less than 36 inches (91.5 cm) from the upper surface of the stair rail system to the surface of the tread. (If installed before March 15, 1991, not less than 30 inches [76 cm]).
- _ Stair rail systems and handrails must be surfaced to prevent injuries such as punctures or lacerations and to keep clothing from snagging.
- _ Ends of stair rail systems and handrails must be built to prevent dangerous projections, such as rails protruding beyond the end posts of the system. In addition,
 - _ Unprotected sides and edges of stairway landings must have standard 42-inch (1.1 m) guardrail systems.
 - _ Intermediate vertical members, such as balusters used as guardrails, must not be more than 19 inches (48 cm) apart.
 - _ Other intermediate structural members, when used, must be installed so that no openings are more than 19 inches (48 cm) wide.
 - _ Screens or mesh, when used, must extend from the top rail to the stairway step and along the opening between top rail supports.

Handrails

Requirements for handrails are as follows:

- _ Handrails and top rails of the stair rail systems must be able to withstand, without failure, at least 200 pounds (890 n) of weight applied within 2 inches (5 cm) of the top edge in any downward or outward direction, at any point along the top edge.

- _ Handrails must not be more than 37 inches (94 cm) high nor less than 30 inches (76 cm) from the upper surface of the handrail to the surface of the tread.
- _ Handrails must provide an adequate handhold for employees to grasp to prevent falls.
- _ Temporary handrails must have a minimum clearance of 3 inches (8 cm) between the handrail and walls, stair rail systems and other objects.
- _ Stairways with four or more risers, or that rise more than 30 inches (76 cm) in height— whichever is less—must have at least one handrail.
- _ Winding or spiral stairways must have a handrail to prevent use of areas where the tread width is less than 6 inches (15 cm).

Midrails

Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members must be provided between the top rail and stairway steps to the stair rail system. When midrails are used, they must be located midway between the top of the stair rail system and the stairway steps.

Fixed Ladders

If the total length of the climb on a fixed

ladder equals or exceeds 24 feet (7.3 m), the ladder must be equipped with ladder safety devices; *or* self-retracting lifelines and rest platforms at intervals not to exceed 150 feet (45.7 m); *or* a cage or well and multiple ladder sections with each ladder section not to exceed 50 feet (15.2 m) in length. These ladder sections must be offset from adjacent sections and landing platforms must be provided at maximum intervals of 50 feet (15.2 m). In addition, fixed ladders must meet the following requirements:

- _ Fixed ladders must be able to support at least two loads of 250 pounds (114 kg) each, concentrated between any two consecutive support added anticipated loads caused by ice buildup,
- _ *Wood ladders* must not be coated with any opaque covering except for identification or warning labels, which may be placed only on one face of a side rail.

Note: A competent person must inspect ladders for visible defects periodically and after any incident that could affect their safe use. edge of a landing area must be no less than 7 inches (18 cm) and no more than 12 inches (30 cm). A landing platform must be provided if the step-across distance exceeds 12 inches (30 cm).

- _ Fixed ladders without cages or wells must have at least a 15-inch (38 cm) clearance width to the nearest permanent object on each side of the centerline of the ladder.
- _ Fixed ladders must be provided with cages, wells, ladder safety devices or self-retracting lifelines where the length of climb is less than 24 feet (7.3 m) but the top of the ladder is at a distance greater than 24 feet (7.3 m) above lower levels.

_ Side rails of through or side-step fixed ladders must extend 42 inches (1.1 m) above the top level or landing platform served by the ladder.

Parapet ladders must have an access level at the roof if the parapet is cut to permit passage through it. If the parapet is continuous, the access level is the top of the parapet.

_ Steps or rungs for through-fixed-ladder extensions must be omitted from the extension; and the extension of side rails must be flared to provide between 24 inches (61 cm) and 30 inches (76 cm) clearance between side rails.

_ When safety devices are provided, the maximum clearance distance between side rail extensions must not exceed 36 inches (91 cm).

_ Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the back side of the ladder.

Cages for Fixed Ladders

The requirements for cages for fixed ladders are as follows:

_ Horizontal bands must be fastened to the side rails of rail ladders or directly to the structure, building or equipment for individual-rung ladders. winds, rigging and impact loads resulting from using ladder safety devices.

_ Individual rung/step ladders must extend at least 42 inches (1.1 m) above an access level or landing platform either by the continuation of the rung spacings as horizontal grab bars or by providing vertical grab bars that must have the same lateral spacing as the vertical legs of the ladder rails.

_ Each step or rung of a fixed ladder must be able to support a load of at least 250 pounds (114 kg) applied in the middle of the step or rung.

_ Minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches (41 cm).

_ Rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.

_ Rungs and steps of fixed metal ladders manufactured after March 15, 1991, must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.

_ Minimum perpendicular clearance between fixed ladder rungs, cleats, and steps and any obstruction behind the ladder must be 7 inches (18 cm), except that the clearance for an elevator pit ladder must be 4.5 inches (11cm).

_ Minimum perpendicular clearance between

the centerline of fixed ladder rungs, cleats and steps, and any obstruction on the climbing side of the ladder must be 30 inches (76 cm). If obstructions are unavoidable, clearance may be reduced to 24 inches (61 cm), provided a deflection device is installed to guide workers around the obstruction.

_ Step-across distance between the center of the steps or rungs of fixed ladders and the nearest

Ladder Safety Devices and Related Support

Systems for Fixed Ladders

The connection between the carrier or lifeline and the point of attachment to the body belt or harness must not exceed 9 inches (23 cm) in length. In addition, ladder safety devices and related support systems on fixed ladders must conform to the following:

_ All safety devices must be able to withstand, without failure, a drop test consisting of a 500-pound weight (226 kg) dropping 18 inches (41 cm).

_ All safety devices must permit the worker to

ascend or descend without continually having to hold, push or pull any part of the device, leaving both hands free for climbing.

_ All safety devices must be activated within 2 feet (.61 m) after a fall occurs and limit the descending velocity of an employee to 7 feet/second (2.1 m/sec) or less.

Requirements for Mounting Ladder

Safety Devices for Fixed Ladders

The requirements for mounting ladder safety devices for fixed ladders are as follows:

_ Mountings for rigid carriers must be attached at each end of the carrier, with intermediate mountings spaced along the entire length of the carrier, to provide the necessary strength to stop workers' falls.

_ Mountings for flexible carriers must be attached at each end of the carrier. Cable

guides for flexible carriers must be installed with a spacing between 25 feet (7.6 m) and 40 feet (12.2 m) along the entire length of the carrier, to prevent wind damage to the system.

_ Design and installation of mountings and cable guides must not reduce the strength of the ladder.

_ Side rails and steps or rungs for side-step fixed ladders must be continuous in extension.

_ Vertical bars must be on the inside of the horizontal bands and must be fastened to them.

_ Cages must not extend less than 27 inches

(68 cm), or more than 30 inches (76 cm) from the centerline of the step or rung and must not be less than 27 inches (68 cm) wide.

_ Insides of cages must be clear of projections.

_ Horizontal bands must be spaced at intervals not more than 4 feet (1.2 m) apart measured from centerline to centerline.

_ Vertical bars must be spaced at intervals not more than 9.5 inches (24 cm), measured centerline to centerline.

_ Bottoms of cages must be between 7 feet (2.1 m) and 8 feet (2.4 m) above the point of

access to the bottom of the ladder. The bottom of the cage must be flared not less than 4 inches (10 cm) between the bottom horizontal band and the next higher band.

Tops of cages must be a minimum of 42 inches (1.1 m) above the top of the platform or the point of access at the top of the ladder. There must be a way to access the platform or other point of access

ladder. There must be a way to access the platform or other point of access.

Wells for Fixed Ladders

The requirements for wells for fixed ladders are as follows:

- _ Wells must completely encircle the ladder.
- _ Wells must be free of projections.
- _ Inside faces of wells on the climbing side of the ladder must extend between 27 inches (68 cm) and 30 inches (76 cm) from the centerline of the step or rung.
- _ Inside widths of wells must be at least 30 inches (76 cm).
- _ Bottoms of wells above the point of access to the bottom of the ladder must be between 7 feet (2.1 m) and 8 feet (2.4 m).

Portable Ladders

The minimum clear distance between side rails for all portable ladders must be 11.5 inches (29 cm).

Subpart X - Stairways and Ladders

§ 1926.1050 - Scope, application, and definitions applicable to this subpart.

(a) Scope and application. This subpart applies to all stairways and ladders used in construction, alteration repair (including painting and decorating), and demolition workplaces covered under 29 CFR part 1926, and also sets forth, in specified circumstances, when ladders and stairways are required to be provided. Additional requirements for ladders used on or with scaffolds are contained in Subpart L - Scaffolds.

(b) Definitions.

Cleat means a ladder crosspiece of rectangular cross section placed on edge upon which a person may step while ascending or descending a ladder.

Double-cleat ladder means a ladder similar in construction to a single-cleat ladder, but with a center rail to allow simultaneous two-way traffic for employees ascending or descending.

Equivalent means alternative designs, materials, or methods that the employer can demonstrate will provide an equal or greater degree of safety for employees than the method or item specified in the standard.

Extension trestle ladder means a self-supporting portable ladder, adjustable in length consisting of a trestle ladder base and a vertically adjustable extension section, with a suitable means for locking the ladders together.

Failure means load refusal, breakage or separation of component parts. Load refusal is the point where the structural members lose their ability to carry the loads.

Fixed-ladder means a ladder that cannot be readily moved or carried because it is an integral part of a building or structure. A side-step fixed ladder is a fixed ladder that requires a person getting off at the top to step to the side of the ladder side rails to reach the landing. A through fixed ladder is a fixed ladder that requires a person getting off at the top to step between the side rails of the ladder to reach the landing.

Handrail means a rail used to provide employees with a handhold for support.

Individual-rung/step ladders means ladders without a side rail or center rail support. Such ladders are made by mounting individual steps or rungs directly to the side or wall of the structure.

Job-made ladder means a ladder that is fabricated by employees, typically at the construction site, and is not commercially manufactured. This definition does not apply to any individual-rung/step ladders.

Ladder stand. A mobile fixed size self-supporting ladder consisting of a wide flat tread ladder in the form of stairs. The assembly may include handrails.

Lower levels means those areas to which an employee can fall from a stairway or ladder. Such areas include ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, material, water, equipment, and similar surfaces. It does not include the surface from which the employee falls.

Maximum intended load means the total load of all employees, equipment, tools, materials, transmitted loads, and other loads anticipated to be applied to a ladder component at any one time.

Nosing means that portion of a tread projecting beyond the face of the riser immediately below.

Point of access means all areas used by employees for work related passage from one area or level to another. Such open areas include doorways, passageways, stairway openings, studded walls, and various other permanent or temporary openings used for such travel.

Portable ladder means a ladder that can be readily moved or carried.

Riser height means the vertical distance from the top of a tread to the top of the next higher tread or platform/landing or the distance from the top of a platform/landing to the top of the next higher tread or platform/landing.

Side-step fixed ladder. See "Fixed ladder."

Single-cleat ladder means a ladder consisting of a pair of side rails, connected together by cleats, rungs, or steps.

Single-rail ladder means a portable ladder with rungs, cleats, or steps mounted on a single rail instead of the normal two rails used on most other ladders.

Spiral stairway means a series of steps attached to a vertical pole and progressing upward in a winding fashion within a cylindrical space.

Stairrail system means a vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels. The top surface of a stairrail system may also be a "handrail."

Step stool (ladder type) means a self-supporting, foldable, portable ladder, nonadjustable in length, 32 inches or less in overall size, with flat steps and without a pail shelf, designed to be climbed on the ladder top cap as well as all steps. The side rails may continue above the top cap.

Through fixed ladder. See "Fixed ladder."

Tread depth means the horizontal distance from front to back of a tread (excluding nosing, if any).

Unprotected sides and edges means any side or edge (except at entrances to points of access) of a stairway where there is no stairrail system or wall 36 inches (.9 m) or more in height, and any side or edge (except at entrances to points of access) of a stairway landing, or ladder platform where there is no wall or guardrail system 39 inches (1 m) or more in height.

§ 1926.1051 - General requirements.

(a) A stairway or ladder shall be provided at all personnel points of access where there is a break in elevation of 19 inches (48 cm) or more, and no ramp, runway, sloped embankment, or personnel hoist is provided.

(a)(1) Employees shall not use any spiral stairways that will not be a permanent part of the structure on which construction work is being performed.

(a)(2) A double-cleated ladder or two or more separate ladders shall be provided when ladders are the only mean of access or exit from a working area for 25 or more employees, or when a ladder is to serve simultaneous two-way traffic.

(a)(3) When a building or structure has only one point of access between levels, that point of access shall be kept clear to permit free passage of employees. When work must be performed or equipment must be used such that free passage at that point of access is restricted, a second point of access shall be provided and used.

(a)(4) When a building or structure has two or more points of access between levels, at least one point of access shall be kept clear to permit free passage of employees.

(b) Employers shall provide and install all stairway and ladder fall protection systems required by this subpart and shall comply with all other pertinent requirements of this subpart before employees begin the work that necessitates the installation and use of stairways, ladders, and their respective fall protection systems.

§ 1926.1052 - Stairways.

(a) *General.* The following requirements apply to all stairways as indicated:

(a)(1) Stairways that will not be a permanent part of the structure on which construction work is being performed shall have landings of not less than 30 inches (76 cm) in the direction of travel and extend at least 22 inches (56 cm) in width at every 12 feet (3.7 m) or less of vertical rise.

(a)(2) Stairs shall be installed between 30 deg. and 50 deg. from horizontal.

(a)(3) Riser height and tread depth shall be uniform within each flight of stairs, including any foundation structure used as one or more treads of the stairs. Variations in riser height or tread depth shall not be over 1/4-inch (0.6 cm) in any stairway system.

(a)(4) Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width of the platform to less than 20 inches (51 cm).

(a)(5) Metal pan landings and metal pan treads, when used, shall be secured in place before filling with concrete or other material.

(a)(6) All parts of stairways shall be free of hazardous projections, such as protruding nails.

(a)(7) Slippery conditions on stairways shall be eliminated before the stairways are used to reach other levels.

(b) *Temporary service.* The following requirements apply to all stairways as indicated:

(b)(1) Except during stairway construction, foot traffic is prohibited on stairways with pan stairs where the treads and/or landings are to be filled in with concrete or other material at a later date, unless the stairs are temporarily fitted with wood or other solid material at least to the top edge of each pan. Such temporary treads and landings shall be replaced when worn below the level of the top edge of the pan.

(b)(2) Except during stairway construction, foot traffic is prohibited on skeleton metal stairs where permanent treads and/or landings are to be installed at a later date, unless the stairs are fitted with secured temporary treads and landings long enough to cover the entire tread and/or landing area.

(b)(3) Treads for temporary service shall be made of wood or other solid material, and shall be installed the full width and depth of the stair.

(c) *Stairrails and handrails.* The following requirements apply to all stairways as indicated:

(c)(1) Stairways having four or more risers or rising more than 30 inches (76 cm), whichever is less, shall be equipped with:

(c)(1)(i) At least one handrail; and

(c)(1)(ii) One stairrail system along each unprotected side or edge.

Note: When the top edge of a stairrail system also serves as a handrail, paragraph (c)(7) of this section applies.

(c)(2) Winding and spiral stairways shall be equipped with a handrail offset sufficiently to prevent walking on those portions of the stairways where the tread width is less than 6 inches (15 cm).

(c)(3) The height of stairrails shall be as follows:

(c)(3)(i) Stairrails installed after March 15, 1991, shall be not less than 36 inches (91.5 cm) from the upper surface of the stairrail system to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

(c)(3)(ii) Stairrails installed before March 15, 1991, shall be not less than 30 inches (76 cm) nor more than 34 inches (86 cm) from the upper surface of the stairrail system to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

(c)(4) Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members, shall be provided between the top rail of the stairrail system and the stairway steps.

(c)(4)(i) Midrails, when used, shall be located at a height midway between the top edge of the stairrail system and the stairway steps.

(c)(4)(ii) Screens or mesh, when used, shall extend from the top rail to the stairway step, and along the entire opening between top rail supports.

(c)(4)(iii) When intermediate vertical members, such as balusters, are used between posts, they shall be not more than 19 inches (48 cm) apart.

(c)(4)(iv) Other structural members, when used, shall be installed such that there are no openings in the stairrail system that are more than 19 inches (48 cm) wide.

(c)(5) Handrails and the top rails of stairrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890 n) applied within 2 inches (5 cm) of the top edge, in any downward or outward direction, at any point along the top edge.

- (c)(6) The height of handrails shall be not more than 37 inches (94 cm) nor less than 30 inches (76 cm) from the upper surface of the handrail to the surface of the tread, in line with the face of the riser at the forward edge of the tread.
- (c)(7) When the top edge of a stairrail system also serves as a handrail, the height of the top edge shall be not more than 37 inches (94 cm) nor less than 36 inches (91.5 cm) from the upper surface of the stairrail system to the surface of the tread, in line with the face of the riser at the forward edge of the tread.
- (c)(8) Stairrail systems and handrails shall be so surfaced as to prevent injury to employees from punctures or lacerations, and to prevent snagging of clothing.
- (c)(9) Handrails shall provide an adequate handhold for employees grasping them to avoid falling.
- (c)(10) The ends of stairrail systems and handrails shall be constructed so as not to constitute a projection hazard.
- (c)(11) Handrails that will not be a permanent part of the structure being built shall have a minimum clearance of 3 inches (8 cm) between the handrail and walls, stairrail systems, and other objects.
- (c)(12) Unprotected sides and edges of stairway landings shall be provided with guardrail systems. Guardrail system criteria are contained in subpart M of this part.

BASIC BUILDING CODE REQUIREMENTS (1993)

Increasingly, installers are asking questions about building codes and out outdoor products. There are four major organizations which have developed standardized building codes. Some states have adopted these and/or amended versions, on a state-wide basis. Otherwise, each local jurisdiction elects which code they will follow. Additionally, many local jurisdictions enact their own amendments to the standard codes.

THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS, BOCA, AND THE SOUTHERN BUILDING CODE CONGRESS are the three major promulgators of codes. In addition a code for one and two family dwelling has been developed jointly by these three organizations, THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (CABO).

The following is an abbreviated statement of the latest codes requirements to be generally issued, BOCA 1993. These codes, when met will meet almost every situation, Frequently localities do not update their codes, and their requirements are not as stringent as these cited below.

STAIR HAND RAILS

- Stair hand rails must have a 1 ½" clearance from adjacent walls.
- Stair rails cannot project more than 3 ½" into the required width of stairs.
- Stair rails can not be less than 34" or more than 38" high measured from leading edge of treads of above finished floor of landing.
- BOCA (1993): Stairway handrails shall have a circular cross section with an outside diameter of at least 1 ¼" and not more than 2". Except any other shape with perimeter dimension of at least 4" and not more than 6 ¼" can have a cross section not exceeding 2 ¼". *The codes are primarily written for pipe rails. Our rail is attractive as well as functional. Some inspectors have questioned the use of our guard rail as a handrail for steps, due to the circumference of the grip. We have been successful in getting it approved by working with the inspectors. However, to facilitate the approval process, we are working on an additional design for the stair handrail.*
- STANDARD BUILDING CODE: Cross section on gripping surface shall be 1 ¾" plus or minus ¼".

STAIRS

- The maximum rise of a set of stairs between landings is twelve feet (12').
- Stairs which are part of egress must be at least 36" wide.
- In residential settings (single and two-family dwelling units), the 1992 CABO code calls for the minimum rise to be 4" and the maximum rise allowed 8 ¼". The 1995 CABO Code sets the maximum riser at 7 ¾". An exception is allowed if replacing an existing stair where there is no ability to meet current requirements. The 1992 CABO Code minimum tread depth is 9". Where the risers are closed in, there must be uniform nosing, not to exceed 1 ½". The 1995 CABO Code establishes the minimum tread at 10" and the nosing for closed in steps at ¾" to 1 ¼".
- The 1992 CABO Code states that the rise between steps and the tread depth cannot vary by more than 3/16" between adjacent steps and that no two risers or treads within a staircase can vary by more than 3/8". The 1995 CABO Code states that the variance cannot be more than 3/8" in the set of steps.
- In residential applications, the triangle formed by the tread/riser/bottom rail must be such that a 6" cylinder cannot pass through the opening.
- In multiple (more than two) dwelling units, the triangle formed by the tread/riser/bottom rail must be such that a 4" cylinder cannot pass through the opening.

GUARDRAILS

- A guard rail is a system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level.
- Guardrails are required where the open surface of a platform is more than 30" above grade.
- BOCA: The top of a guardrail shall have a height not less than 36", and not more than 42" high.
- SOUTHERN BUILDING CODE: Guardrails must be at least 42" above the platform, except residential which must be a minimum of 36".
- BOCA: In residential, institutional, and commercial applications, there must be intermediate materials (pickets) such that a 4" sphere cannot pass through. They must also be constructed so there is not ladder effect so they cannot be climbed.
- SOUTHERN BUILDING CODE: A bottom rail of curb shall be provided that will reject the passage of a 2" sphere.

